Undergraduate Catalog of Courses

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Chemistry

Saint Mary's College of California

CHEMISTRY

The Chemistry Department seeks to offer a versatile academic program that will prepare students for a variety of options upon graduation: employment in industry, graduate work in chemistry or related fields, entry into professional schools such as medicine or dentistry, or teaching at the K–12 level. Using a balance of theoretical and experimental work, the curriculum attempts to provide students with a solid understanding of fundamental concepts, the ability to reason through unfamiliar problems, the tools to investigate a topic in depth, and the communication skills that are needed to share information with others.

The department recognizes that since chemistry is a discipline whose primary focus is the underlying substance of the universe, it is important both independently and in relation to other fields of study. For these reasons the department strives to connect the curriculum to other disciplines and real-world examples whenever possible, and to routinely offer courses to meet the needs of students who are not science majors.

FACULTY

Jeffrey A. Sigman, Ph.D., *Associate Professor, Chair*
Kenneth J. Brown, Ph.D., *Professor*
Steven J. Bachofer, Ph.D., *Professor*
Valerie A. Burke, Ph.D., *Assistant Professor*
Joel D. Burley, Ph.D., *Associate Professor*
John S. Correia, Ph.D., *Professor, Emeritus*
Patricia Jackson, Ph.D., *Adjunct*
Alexander J. Pandell, Ph.D., *Adjunct*
Michelle L. Shulman, Ph.D., *Associate Professor*

LEARNING OUTCOMES

The learning outcomes for the Chemistry Department are organized into five general categories:

- **TOOLS** for learning
- **FUNDAMENTAL** knowledge and conceptual understanding
- **INVESTIGATIVE** skills
- **COMMUNICATION** skills
- **SOCIETAL AWARENESS** and concerns

ADMISSION REQUIREMENTS

Students planning a major in chemistry must present credits in one year of chemistry, one year of physics, and four years of mathematics, and should have at least a B average in these subjects. Students with a good high school record but lacking credit in any of these subjects should remove any deficiencies in summer school. Students planning a science major should be particularly alert to the language proficiency requirement (see Program of Study, p. 42).

MAJOR REQUIREMENTS

The student with an interest in chemistry can pursue one of two options in chemistry or pursue a Biochemistry major (See Biochemistry major, p. 61) which integrates material from the fields of Chemistry and Biology. The department offers the standard chemistry major and chemistry major with an environmental concentration.

SUGGESTED CHEMISTRY MAJOR PROGRAM

A suggested four-year program of study for a major in chemistry is available from any Chemistry Department member. Note that all freshmen are required to complete two Collegiate Seminars in the first year, one each in the fall and spring terms. Two additional Collegiate Seminars must be completed before graduation, and other College requirements are specified in the Program of Study (see p. 42).

LOWER DIVISION

The following lower-division courses are required for the two majors in chemistry: **Chemistry 8, 9 (lab), 10, 11 (lab), 89; Mathematics 27, 28.** Each major has additional lower-division requirements as follows: For the standard chemistry major, **Mathematics 29** and **Physics 1, 2 (lab), 3, 4 (lab)** must also be completed. For the chemistry major–environmental concentration, students must also take: **Physics 1, 2 (lab), 3, 4 (lab)** or **Physics 10, 20 (lab), 11, 21 (lab)** and **Biology 1 (with lab), 2 (with lab).** The Biochemistry major has very similar requirements (See Biochemistry major, p. 61).

UPPER DIVISION

The two chemistry majors include the following core of upper-division courses: **Chemistry 104, 106, 114, 115, 130.** Each major concentration has additional upper-division requirements as follows:

For the standard chemistry major, students must take **Chemistry 108, 110, 111 or 119, 118, 197** or **199.**

For the environmental concentration, students must take **Chemistry 108 or 118, 119,** and any one other upper-division chemistry course. Also required are **Biology 125** and either **Biology 113, 146, or 152.**

MINOR REQUIREMENTS

The minor in chemistry requires **Chemistry 8, 9 (lab)** and **10, 11 (lab),** and any three upper-division chemistry courses excluding **Chemistry 104** and **106**.

PREREQUISITE GRADE

Any course listed in this department with a prerequisite assumes a grade of C– or better in the prerequisite course.

COURSES

LOWER DIVISION

2 Principles of Chemistry
An introduction to topics in organic chemistry and biochemistry for those students with an interest in the life sciences. Students may not enroll in this course until they have been sufficiently counseled as to whether it is appropriate to their needs. This course is designed for Nursing students only. Four lectures per week. Prerequisite: one year of high school chemistry, one year of algebra.

3 Principles of Chemistry Lab (.25)
To accompany Chemistry 2. A simplified introduction to experimentation in chemistry. One lab per week. Laboratory fee required.

8 General Chemistry I
A study of the fundamental principles of chemical science and the chemistry of the more common elements and their compounds. Four meetings per week. *Prerequisite:* High school chemistry.

9 General Chemistry Lab I (.25)
Laboratory to accompany Chemistry 8. Must be taken concurrently with that course. An introduction to experimentation in chemistry. One lab per week. Laboratory fee required.

10 General Chemistry II
A continuation of **Chemistry 8.** Four meetings per week. *Prerequisites:* **Chemistry 8** and **Chemistry 9**.

11 General Chemistry Lab II (.25)
Laboratory to accompany **Chemistry 10.** Must be taken concurrently with that course. One lab per week. *Prerequisites:* **Chemistry 8** and **Chemistry 9.** Laboratory fee required.

20 Concepts in Chemistry
A course especially designed to acquaint the non-science student with science as a way of thinking and to introduce important chemical concepts and their relation to human activities. Three lectures and one lab per week. Laboratory fee required.

89 Chemical Literature (.25)
A systematic investigation of the literature of chemistry and allied fields. One meeting per week.

UPPER DIVISION

Chemistry 8, 9 (lab), 10, and **11 (lab)** with grades of C– or better are prerequisite to all upper-division courses. **Chemistry 104** and **106** are prerequisite to **Chemistry 108, 110, 111** and **130, 135, 136, and 138.** Except for **Chemistry 104** and **106,** the following courses are taught only in alternate years. **Chemistry 197** and **199** are offered as needed.

104 Organic Chemistry I
An introduction to the concepts of structure and reactivity of organic compounds. Four lectures and one lab per week. **Chemistry 104** is offered only in the fall term. Laboratory fee required.

106 Organic Chemistry II
A continuation of **Chemistry 104.** Four lectures and one lab per week. **Chemistry 104** is prerequisite to **Chemistry 106,** which is offered only in the spring term. Laboratory fee required.

108 Theory and Practice of Separation and Identification
A study of the separation, purification, and identification of compounds using chemical, chromatographic, and spectroscopic techniques. Two lectures and two labs per week. Laboratory fee required. Offered in alternate years.

110 Special Topics in Chemistry
An exploration of important areas in modern chemical research involving various elements of the discipline. The course includes reading and discussion of journal articles and may include use of the computer for molecular modeling, information retrieval, and analysis of data, depending on the selected topics. A prime learning objective of this course is to assist the student to use other instructional materials besides textbooks. *Prerequisites:* **Chemistry 89** and **Chemistry 130.** Offered in alternate years.

111 Advanced Organic Chemistry
An in-depth examination of the important mechanisms of organic reactions, the methods used to study them, and the relationship between structure and reactivity. Three lectures per week. Offered in alternate years.

114 Physical Chemistry I
A study of chemical theory, specifically thermodynamics, chemical kinetics, and quantum mechanics. Three meetings and one lab per week. *Prerequisites:* **Mathematics 27, 28. Chemistry 114** is offered only in the fall term. Laboratory fee required. Offered in alternate years.

115 Physical Chemistry II
A continuation of **Chemistry 114.** Three lectures and one lab per week. **Chemistry 114** is prerequisite to **Chemistry 115** which is offered only in the spring term. Laboratory fee required. Offered in alternate years.

118 Instrumental Chemical Analysis
A study of the principles used in the design and construction of instruments and their applications in chemistry. Two lectures and two labs per week. Laboratory fee required. Offered in alternate years.

119 Environmental Chemistry
A study of the theory and practice of water, air, and soil chemistry with emphasis on the problem areas within our environment. Three lectures and one lab per week. Laboratory fee required. Offered in alternate years.

130 Advanced Inorganic Chemistry
A study of the structures, reactions, and relationships of the elements and their compounds. Three lectures per week. Offered in alternate years.

135 Biochemistry (cross-listed with Biology)
A study of the biochemical principles with an emphasis on enzymes and metabolism. of biochemistry. Three lectures and one lab per week. Laboratory fee required. Offered every year. *Prerequisites:* **Biology 1, 1L, 2,** and **2L.**

136 Advanced Topics in Biochemistry
(cross-listed with Biology)
A further study of the biochemical principles with an emphasis on macromolecular structures, membrane related topics (structure, transport, signal recognition and transduction, and other topics not covered in Biochemistry. Three lectures and one lab per week. Laboratory fee required. Offered every year. *Prerequisite:* **Biochemistry 135 (Bio 135)**.

138 Biophysical Chemistry
A study of the physical chemical aspects of biochemistry. Three lectures per week. Offered in alternate years. *Prerequisites:* **Mathematics 27, 28.**

197 Special Study
Laboratory research in chemistry, under the direction of a faculty advisor. Results from the research project will be summarized in the form of a written thesis and an oral or poster presentation. *Prerequisites:* senior standing and the consent of the faculty advisor. Laboratory fee required.

199 Special Study—Honors
Laboratory research in chemistry, under the direction of a faculty advisor. Results from the research project will be summarized in the form of a written thesis and an oral or poster presentation. *Prerequisites:* senior standing, a 3.0 GPA (minimum) in chemistry coursework, and the consent of the faculty advisor. Laboratory fee required.